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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/801,390	03/07/2001	H. Sam Bergh	2000-022	4042

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SYMYX TECHNOLOGIES INC  
LEGAL DEPARTMENT  
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SANTA CLARA, CA 95051

EXAMINER

SODERQUIST, ARLEN

ART UNIT	PAPER NUMBER
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1743

DATE MAILED: 09/29/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

## Office Action Summary

Application No.

09/801,390

Applicant(s)

BERGH ET AL.

Examiner

Arlen Soderquist

Art Unit

1743

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

- 1) ☐ Responsive to communication(s) filed on \_\_\_\_.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims

- 4) ☒ Claim(s) 1-190 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-183 and 186-190 is/are rejected.
- 7) ☐ Claim(s) 184 and 185 is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_ are subject to restriction and/or election requirement.

### Application Papers

- 9) ☒ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

### Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- \* See the attached detailed Office action for a list of the certified copies not received.

### Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)  
Paper No(s)/Mail Date 8-26-02, 2-23-04.
- 4) ☐ Interview Summary (PTO-413)  
Paper No(s)/Mail Date. \_\_\_\_.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: \_\_\_\_.

Art Unit: 1743

1. The disclosure is objected to because of the following informalities: the status of the parent application needs updating.

Appropriate correction is required.

2. Claims 184-185 are objected to under 37 CFR 1.75(c) as being in improper form because a multiple dependent claim should refer to other claims in the alternative only. See MPEP § 608.01(n). Accordingly, the claims 184-185 not been further treated on the merits. Had these claims been proper they would have been rejected over the art of record.

3. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

4. Claims 1-2, 30, 172, and 175-180 rejected under 35 U.S.C. 102(b) as being anticipated by Creer. In the paper Creer teaches the design and construction of a multichannel microreactor for catalyst evaluation. The system is shown in figure 2 and includes 6 reactors with inlets and outlets, a fluid distribution system including on/off valves, mass flow controllers, flow meters and pressure gauges and a gas chromatograph with flame ionization detector. Figure 3 shows an improved system using a mass selective detector (see page 93, last paragraph for this and additional improvements being worked on). Page 89, in the first full paragraph teaches that the four-way selection valves of the fluid distribution system allows for the feeding of up to four different reactants to six different catalysts. With this setup six different catalyst can be tested with the same gas or the same catalyst can be tested with up to four different feed gases, facilitating the rapid screening of catalysts or gas feeds. Page 91 discusses the programming of the catalyst screening microreactor. Page 92 under catalyst evaluation teaches that the unit can be used to screen a large number of catalysts in a relatively short time. The last two paragraphs of page 93 teach that valuable information can be obtained from the instrument and that the instrument is capable of being improved to provide better flow control and different detectors.

5. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

Art Unit: 1743

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
  2. Ascertaining the differences between the prior art and the claims at issue.
  3. Resolving the level of ordinary skill in the pertinent art.
  4. Considering objective evidence present in the application indicating obviousness or nonobviousness.
6. Claims 3-29, 31-171, 173-174, 181-183 and 186-190 are rejected under 35 U.S.C. 103(a) as being unpatentable over Creer as applied to claims 1-2, 30, 172 and 175-180 above, and further in view of Calleja and Southgate (US 5,863,502). Creer does not teach the instantly claimed variation in the capabilities of the fluid distribution system or that the system is formed in a substrate.

In the paper Calleja discloses a method for evaluating process conditions for converting syngas to hydrocarbons under the catalyst Co/HZSM-5 by conducting several experiments (tables 1 and 2; figs. 1-6; EXPERIMENTAL). The catalyst was prepared by the incipient-wetness impregnation technique from cobalt and thorium nitrate solutions using drying, calcination, and reduction conditions previously optimized (EXPERIMENTAL). The ZSM-5 zeolite was synthesized by an undisclosed procedure used in the laboratory. Since there is a concern with the reliability of the experimental data, such that a selected run is repeated three times under the same conditions with the catalyst replaced in the reactor every time, one would expect that each of the catalysts in the reactors are prepared under substantially the same conditions. The feed gases (H<sub>2</sub> and CO) and carrier gas (He) were fed into the reactor, and products water and gasoline range hydrocarbon mixture were collected at the exit. The hydrocarbons of interest include those with at least six carbons (C<sub>6</sub>+) whether they are aromatic, aliphatic, or olefinic. A factorial experimental design was used to establish the influence of process variables on syngas conversion. Suitable ranges of the variables were experimentally determined, and the ranges and values for the central point of the factorial design were deduced.

Four experiments were carried out under the conditions of the central point of the design to determine the standard deviation of the experimental error for the objective function of yield and selectivity to  $C_6+$ . Considering the suitable experimental ranges in the orthogonal factorial design of experiments, sixteen experiments were carried out and the variables were defined in terms of statistical variables (table 1). The results were fitted to non-linear polynomial equations to express the yield and selectivity in terms of the first-order effects and all k-factor interactions. The curvature, which was confirmed by statistical analysis, shows that a simple two-level factorial design was inadequate to describe the dependence of the yield and selectivity on the variables. A higher-level factorial design was used to supplement the experimental design. A central composite design was selected, and a set of eight complementary experiments was carried out. From the experimental results, response surfaces or prediction equations for the yield and selectivity were obtained. Fig. 1 shows the response surface of yield with respect to temperature and pressure for fixed values of space velocity and  $CO/H_2$  molar ratio. Each experiment involves controllably varying a set of reaction conditions, including space velocities, contact times, temperatures, pressures, and feed compositions and determining the conversion of CO and selectivity to  $C_6+$  (abstract; tables 1 and 2; figs. 1-6; EXPERIMENTAL). The following tables illustrate the results from central-point experiments and supplementary experiments of complementary design.

Figure 2. Effect of Reaction Temperature on CO Conversion and $C_6+$ Selectivity						
Experiment #	Temperature (°C)	Space Velocity ( $h^{-1}$ )	$CO/H_2$ Feed Molar Ratio	Pressure (MPa)	CO Conversion (%)	$C_6+$ Selectivity (%)
1	240	0.9	1.2	2.1	11	38
2	280	0.9	1.2	2.1	33	30
3	320	0.9	1.2	2.1	62	8

Figure 3. Effect of Space Velocity on CO Conversion and $C_6+$ Selectivity						
Experiment #	Space Velocity ( $h^{-1}$ )	Temperature (°C)	$CO/H_2$ Feed Molar Ratio	Pressure (MPa)	CO Conversion (%)	$C_6+$ Selectivity (%)
4	0.5	280	1.2	2.1	42	26
5	0.9	280	1.2	2.1	34	30
6	1.3	280	1.2	2.1	25	24

Figure 4. Effect of CO/H <sub>2</sub> on CO Conversion and C <sub>6</sub> + Selectivity						
Experiment #	CO/H <sub>2</sub> Feed Molar Ratio	Temperature (°C)	Space Velocity (h <sup>-1</sup> )	Pressure (MPa)	CO Conversion (%)	C <sub>6</sub> + Selectivity (%)
7	0.5	280	0.9	2.1	79	11
8	1.2	280	0.9	2.1	34	30
9	1.9	280	0.9	2.1	21	31

Figure 5. Effect of Reaction Pressure on CO Conversion and C <sub>6</sub> + Selectivity						
Experiment #	Pressure (MPa)	Temperature (°C)	Space Velocity (h <sup>-1</sup> )	CO/H <sub>2</sub> Feed Molar Ratio	CO Conversion (%)	C <sub>6</sub> + Selectivity (%)
10	0.1	280	0.9	1.2	19	0
11	2.1	280	0.9	1.2	33	29
12	4.1	280	0.9	1.2	35	20

Figure 6. Effect of Contact Time on CO Conversion and C <sub>6</sub> + Selectivity							
Experiment #	Contact Time (h)	Temperature (°C)	Space Velocity (h <sup>-1</sup> )	CO/H <sub>2</sub> Feed Molar Ratio	Pressure (MPa)	CO Conversion (%)	C <sub>6</sub> + Selectivity (%)
13	12	280	0.9	1.0	2.1	37	41
14	24	280	0.9	1.0	2.1	35	37
15	48	280	0.9	1.0	2.1	32	32
16	72	280	0.9	1.0	2.1	35	34
17	120	280	0.9	1.0	2.1	31	33
18	168	280	0.9	1.0	2.1	31	31
19	264	280	0.9	1.0	2.1	31	31

The CO conversion and C<sub>6</sub>+ selectivity were determined from the graphs (figs. 2-6). As shown above, three different temperatures in experiments 1-3, three different space velocities experiments 4-6, three different CO/H<sub>2</sub> Feed Molar Ratios or compositions in experiments 7-9, three different pressures in experiments 10-12, and seven different contact times in experiments 13-19 were used. When the varied set of reaction conditions comprise at least three different space velocities and at least two different temperatures as shown in experiments 1-6, the determined conversion of a conversion-limiting reactant includes a range of values from about 11% to about 62%, which is from less than about 10% to more than about 50%. The range of

conversion values spans about a 51% conversion difference. When the varied set of reaction conditions comprise at least three different space velocities and at least two different pressures as shown in experiments 4-6 and 10-12, the range in conversion is about 19% to about 42%, which is less than about 20% to about more than about 40%. When the varied set of reaction conditions comprise three different temperatures, three different space velocities, and three different feed compositions as show in experiments 1-9, the range of values is about 11% to about 79%, which is from less than about 10% to more than about 70%. Note that the language "comprising" is open language, such that at least three different space velocities, contact times, or combinations thereof, and at least two different temperatures, pressures, or feed compositions affords three different temperatures, three different space velocities, and three different feed compositions. This is especially true when six or more reactors are claimed, such that there are six or more experiments. When the varied set of reaction conditions comprise at least three different space velocities and at least two different contact times as shown in experiments 4-6 and 13-19, the range in conversion is from about 25 % to about 42%, which is less than about 20% to more than about 40% or about 10% to about 50%. The range of conversion values spans a 17% difference, which may be viewed as at least about 10% or 20% conversion difference.

In the patent Southgate teaches a parallel reaction cassette and associated devices. The parallel reaction device is for conducting reactions and comprises one or more reaction flow-ways, each such reaction flow-way having one or more chambers connected serially by fluid exchange channels, additional fluid exchange channels connecting the reaction channels in parallel, valve means for initiating and impeding the flow of fluids through the fluid exchange channels, and means for moving the flow of fluids into and out of the chambers. The reactors are used for automating the PCR reaction and overcome the four critical problems outlined in column 2. relevant to the instant claims are the third and fourth problems related to volume of materials used in the reaction and meaningful results through multiple parallel reactions for comparison purposes.

It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the reactor system of Creer with a fluid distribution system capable of performing the different reactions taught by Calleja because of the ability to characterize a catalyst as taught by Calleja in an efficient manner as taught by Creer. It would have been

Art Unit: 1743

obvious to one of ordinary skill in the art at the time the invention was made to provide the parallel reactor system of Creer in a format as taught by Southgate because of the size (volume) and meaningful results advantages taught by Southgate for the parallel reaction cassette of Southgate

7. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. The additionally cited art contains related patents and art relevant to gas feed or parallel reactor systems.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Arlen Soderquist whose current telephone number is (571) 272-1265 as a result of the examiner moving to the new USPTO location. The examiner's schedule is variable between the hours of about 5:30 AM to about 5:00 PM on Monday through Thursday and alternate Fridays.

A general phone number for the organization to which this application is assigned is (571) 272-1700. The fax phone number to file official papers for this application or proceeding is (703) 872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).



September 28, 2004

ARLEN SODERQUIST  
PRIMARY EXAMINER